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SKELETAL REMAINS WITH CULTURAL ASSOCIATIONS FROM THE CHICAMA, MOCHE, AND VIRÚ VALLEYS, PERU

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(Based partly on material and data supplied by Rafael Larco Hoyle)

The relationship of cranial type to culture in coastal Peru is just beginning to be examined. Hrdlička (1911, 1914) maintained, as did earlier writers, that the basic natural type of the whole coast was brachycranic. He concluded, also, on the basis of certain ceramic associations, that at least in the Chicama Valley this original round-headed type had been supplanted largely by one that was long-headed. Subsequently, however, Kroeber (1926b, 1930) identified the ceramics on which Hrdlička's conclusion was based as being Early instead of Late and hence decided that the earliest type was long-headed. Moreover, Kroeber believes that this long-headed form did not change in the Chimu area from Early to Late times. Elsewhere along the coast almost nothing is known about the changes that may have taken place in the natural skull shapes. The chief reason for the lack of such information in a region where crania are so plentiful is the fact that most of the coastal crania are deformed.

In the matter of the relationship of deformity type to culture we have more information, owing chiefly to Professor Kroeber's accurate observations. These observations pertain mainly to four parts of the coast: (1) The region of Trujillo on the north coast, (2) about Lima on the central coast, (3) the Cañete Valley south of Lima, and (4) the region of Nazca on the southern coast. Taking these four areas in the order enumerated, we may briefly summarize Kroeber's findings:

Around Trujillo the long-headed and undeformed type of the Early Chimu people, according to Kroeber (1926b, 1930), was followed by a fronto-occipitally deformed type in the Middle period and in Late Chimu times by one often exhibiting simple occipital deformity. The variety of fronto-occipital deformity characteristic of this part of the coast has been classified by Imbelloni (1933) as "tabular erecta," that is, with the occipital flattening vertically directed. Examples are shown in plates 11 and 12.

In the Lima region the skulls of the Proto-Lima people, probably slightly earlier in time than the Early Chimu of the north coast, are said by Kroeber (1926a) to be undeformed. On the other hand, the skulls of the Sub-Chancay people, a population in a later cultural phase, show occipital flattening alone in the majority of cases. It is noteworthy, too, that burial position correlates with this subdivision: The Proto-Lima skeletons are found extended, whereas the Sub-Chancay skeletons are flexed.

In the Cañete Valley, where Kroeber (1937) found Middle and Late period burials, the skulls from the Middle period were the more extremely deformed. In this case the pressure had been applied both high on the forehead and on the occiput in such a way as to broaden and lower the height of the vault. Some of the Late skulls are said to have simple occipital flattening.

From Cañete south into the Nazca area Kroeber (1926a) has called attention to the constant association of heavy frontal deformation with the Sub-Nazca culture and of light simple occipital deformation with the late Chinca culture. Examples of extreme deformity types from the south coast are shown in plates 13 and 14. The details of these types, which have not been analyzed clearly as yet, seem to vary from site to site or valley to valley. However, their correlation with the several cultural phases is an established fact. As Kroeber (1930, p. 71) remarks, "deformation, when its type and distributions have been worked out, promises to be an important and convenient criterion to culture classification because of the ease with which cranial material usually is obtainable."

In addition to these general correlations between cranial or deformity type and culture, as just outlined, a few measurements on culturally identified skulls also have been published. For these data we must acknowledge indebtedness again to Professor Kroeber. As these measurements stand now, however, they are very little more useful than those on earlier series identified only as to site. The reason for this low valuation is the fact that these identified specimens are small in number and most of them are deformed. There are, in fact, data on only two small series: One from the Chicama-Moche-Virú region (Kroeber, 1930), consisting of 49 adults (8 Early, 6 Middle, and 35 Late), and the other from the Cañete

Valley, consisting of 34 unsexed adults (23 Middle, 11 Late). For both series the measurements are limited to the three diameters of the vault and the effect of deformity is not indicated.

In following the progress of Professor Kroeber's studies I have searched vainly through the large collections from coastal Peru in our National Museum for culturally identified specimens. For the most part the skulls are not labeled as to exact site. And even when the site is known, it may have existed through several cultural periods, or its cultural position may still be unknown. This condition of our collections, as indeed holds also for most of the 7,000 or so skulls from Peru in American museums (cf. Cobb, 1933), has resulted from the fact that collectors obtained the specimens from the surface or did not excavate them carefully. I do not mean to imply that these collections are not valuable; this, in any event, would be dispelled by the general studies that already have been based thereon (cf. esp. Hrdlička, 1938, 1940; Stewart, 1931). Nevertheless, this material must be considered of secondary importance in relating physical type and culture.

In view of this situation, I decided, when an opportunity came in 1941 to make a brief visit to Peru, that my primary objective would be to search for and, if possible, to examine culturally identified material in Peruvian museums. My efforts were rewarded to a certain extent in Lima, thanks to the assistance of Dr. Julio C. Tello. I was able to study about 12 of the famous Paracas (pre-Nazca) mummies at the Museum of Anthropology (Magdalena Vieja) and a larger series of coastal Inca remains from Malena at the Archeological Museum of San Marcos University. At Chiclín, thanks to a kind invitation from Sr. Rafael Larco Hoyle, I was fortunate in being able to examine a small skeletal series pertaining to two cultural periods in the Chicama-Moche-Virú region. This material is preserved in the Museo Arqueológico "Rafael Larco Herrera."

The present report deals only with the series examined at Chiclín. I have felt justified in describing this new series at some length, in spite of the fact that it is small, for two reasons: (1) Because, as pointed out above, only 14 skulls certainly identified with the Early and Middle cultural periods of this region have been partly described (Kroeber, 1930), and (2) because the recent work in the vicinity of Lima by Dr. Marshall T. Newman (see Strong, 1942) will supply comparable but more extensive data for the central coast.

PROBLEMS

Even though at this stage of our knowledge it is important to record small series that are culturally identified, every effort should be made also to discover the significance of this material. Something in the

way of interpretation is possible in connection with the present series only by reason of the existence in the U. S. National Museum of a large miscellaneous collection from the "Chicama Valley." This collection probably is a random sampling from about 30 sites and represents all cultural periods.[1]

Now it happens that this miscellaneous collection includes both deformed and undeformed skulls (see plates 15 and 16). This fact makes it possible to assemble statistically adequate series of undeformed skulls on the one hand and of deformed skulls on the other, on the basis of which to seek answers to the following questions: (1) How does the homogeneity of the undeformed series compare with that of other populations? (2) Were the people who deformed their heads of the same skull type as those who did not follow this custom? If in answer to the first of these questions we find a degree of homogeneity comparable to that of other Indian populations, each from one place and time, we may conclude either that the undeformed skulls found in the Chicama-Moche-Virú region are all from one cultural period, or, as is more likely, that only one physical type has occupied the region. If, conversely, this undeformed sample is found to be quite variable in many of its characters, we will be dealing of course with a mixed population. The answer to the second question, then, which is self-explanatory, should also provide data on the homogeneity of the deformed group for comparison with the undeformed.

After investigating these problems I shall discuss the classification of physical types in America as it relates to the material under consideration.

CULTURE

The division of the skeletal material seen at Chiclín into two parts representing two cultural periods had been determined prior to my visit on the basis of the associated cultural objects, chiefly pottery. Secondary evidence for the division consisted of burial custom, discoloration of the bones from accompanying pigments, and cranial deformity. These two cultural periods are known, following the Larco terminology, as Cupisnique and Mochica.

It was a pleasure to find the skeletal remains under consideration carefully preserved in individual wooden boxes constructed for the purpose. Moreover, there was ready recourse when necessary to a

[1] Hrdlička stated in 1911 that his collections from the district of Trujillo "comprise over 1100 crania" (p. 7). Referring to this collection in 1914 he states that "over 1200 crania . . . were secured" (p. 45). Although about 25 skulls have been sent away in exchanges and 42 others could not be used in the present study, the remainder numbers 996, so that there does not appear ever to have been quite so many skulls in this collection as has been stated. All this material is catalogued "Chicama Valley," but a small percentage is from the Moche Valley and intervening coast. Dr. Hrdlička tells me now that all usable exposed specimens were taken.

full photographic and written record of the excavations and of the associated cultural objects. These splendid records greatly enhance the value of the collections as well as studies based thereon.

The cultural picture, as given to me by Sr. Larco, briefly stated, is as follows[2]: The Cupisnique (Chavín of Tello, Middle Moche I of Bennett) skeletons are found always flexed (see pl. 17*a*). The most common position is on the back with legs flexed either both on one side or one on each side. Other positions include side or face down. The graves are relatively simple, being only a circular or elliptical hole in the ground. One to four clay pots have been found accompanying the body, together with stone vessels and various semiprecious stones used as ornaments. The pottery is usually of a dark gray color, but may be orange-red or be decorated in combinations of red and black or red and white. Usually a red pigment had been placed in the grave in small bags, which subsequently rotted away, and hence some of the bones often are found to be discolored. Metals have not been encountered in the graves.

In contrast to the Cupisnique graves those of the Mochica (Early Chimu of Kroeber, Early Moche of Bennett) are fairly elaborate. There is a boxlike chamber constructed of rectangular adobes. The shape of this tomb is variable, being either irregularly elliptical, round or rectangular, simple or multiple. Sometimes there is a rude cane coffin. The skeletons found in these tombs are always extended on the back with arms to the sides (see pl. 17*b*). Positional variations include crossing of the feet and crossing of the hands over the pelvis. Accompanying the body there have been found 1 to 133 pieces of pottery, placed at the head and/or feet, or in especially constructed containers in the walls of the tomb. In the case where 133 pieces were found with the burial they were actually covering the whole body. This pottery is characterized by designs in red and white and by a multiplicity of forms. (See also Kroeber, 1930; Bennett, 1939.) Encountered in the graves also are ornaments of gold, silver, and copper[3] together with various semiprecious stones.

The Cupisnique skulls usually show the fronto-occipital ("tabular erecta" of Imbelloni) type of deformity, whereas the Mochica skulls are undeformed.

There is some disagreement as to the relative age of these two cultures. Bennett, who visited this region in 1936, before any Cupisnique graves had been found, places the Cupisnique culture as later than Mochica, on the basis of sherd analysis. He remarks "that the

[2] Since this was first written Sr. Larco's publication "Los Cupisniques" (1941) has appeared, which, together with "Los Mochicas" (1938, 1939), should be consulted for further details. I understand that a temporally intermediate group between Cupisnique and Mochica now has been discovered. It has been named "Salinar." Nothing has been reported as yet concerning the skeletal type.

[3] Green copper stain about the alveolus and face of the skull is a common finding.

Chavín Coast ceramics are not primitive, but extremely well finished" (1939, p. 93). Sr. Larco contends that Cupisnique is the older, basing his argument on stratification (see pl. 17*c*), the simplicity of the graves, and the absence of metals. On the other hand, judged from the findings elsewhere along the coast as described above, it is not unusual for the custom of cranial deformity to appear early and then disappear, only to reappear in modified form in later periods. However, without attempting to decide this point I shall compare the skeletal remains of these two groups in an effort to detect differences in physical type.

DEFORMITY

Although the majority of the Cupisnique skulls were deformed, 4 of the 13 examined appeared to have no deformity. Since two of these presumably undeformed skulls have an index above 80, there is the possibility that they too may be deformed slightly. The most extreme case of deformity in this group is shown in plate 11. Here the flattening of the occiput is vertical and more on the left side than on the right. This contrasts with the Nazca type of deformity in which the occiput is rounded and usually symmetrical (pl. 13). The flattening of the frontal in this Cupisnique skull also is not so extreme as in the Nazca type, where a concave outline is not uncommon. The type of deformity characteristic of the Cupisnique skulls is fronto-vertico-occipital ("tabular erecta" of Imbelloni), whereas that found among the Nazca people is parallelo-fronto-occipital ("tabular oblicua" of Imbelloni) and perhaps of the pseudo-circular subtype (Stewart, 1941). I disagree, therefore, with Dr. Kroeber (1930, p. 67) when he says that "in many cases the fronto-occipital deformation in the Chimu area is as pronounced as in the average Nazca culture skull, and of similar type."

Speaking of the Trujillo district as a whole, Hrdlička (1914) ultimately concluded that all the deformed skulls had been modified in the same manner (fronto-occipital) but to varying degrees; that frontal deformity had not always been permanent, or in other words that "the pressure on the forehead was inadequate to cause enduring changes in that region" (p. 48). Kroeber (1930, p. 70), however, distinguished between fronto-occipital and occipital deformity and believes that these two "preferential trends" represent different chronological periods. Although I cannot decide this point, from my analysis of the undated material from the Chicama Valley (table 1) I can understand Hrdlička's viewpoint, for degrees of frontal and occipital flattening are rather closely correlated; that is, there is a tendency when occipital flattening is pronounced, for the frontal flattening to be definite, but when occipital flattening is slight the frontal flattening usually is indistinct or absent. However, frontal flattening is quite

definite in only 10.8 percent of the collection, whereas a corresponding grade of occipital flattening occurs in at least 36.6 percent.

In many of the extreme cases the posterior part of the skull is bilobate, suggesting a deforming apparatus like that pictured by Carrión Cachot (1923, pp. 347–349) from Lambayeque. In the main, however, the deformity probably could have been produced by a cradle such as that pictured in plate 18 and dating from Chimu times. Such a cradle would permit the infant's head to turn, and this might account for the asymmetry of the occipital flattening that is to be seen in about 50 percent of all cases and is more common on the right than on the left side.

TABLE 1.—*Intensity of deformity in crania from the Chicama Valley, Peru*

Type	Number	Percent	Asymmetry		
Undeformed:					
Dolichocranic [1]	234	23. 5			
Brachycranic [1]	143	14. 4			
	377	37. 9			
Deformed:					
Front. flat. sl. or abs.; occ. flat. sl. and sym.	[2] 36	3. 6			
Front. flat. sl. or abs.; occ. flat. sl. and asym.	218	21. 9	Rt. occ. flatter than Lt	*Number* 248	*Percent* 51. 9
Front. flat. sl. or abs.; occ. flat. mod. or pron. (sym. or asym.).	257	25. 8	Lt. > Rt	230	48. 1
Front. flat. mod; occ. flat. mod. or pron. (sym. or asym.).	108	10. 8		478	100. 0
	619	62. 1			

[1] By inspection.

[2] Judged to be deformed.

Even in the extreme stages of deformity a concave frontal flattening seldom is seen among skulls from the Chicama Valley. Nevertheless, the widening of the skull produced here by occipital compression is reflected in the proportions of the frontal bone; the frontal index (frontal chord/minimum frontal diameter×100) usually is over 80 and reaches as high as 94 and probably higher. On the other hand, skulls in the National Museum from Coyungo (Nazca area) not only have concave frontals but give frontal indices often between 75 and 80, and in one case below 75. These narrow frontal bones correlate with the elongated skulls that typify the Nazca type of deformity (pl. 13).

MEASUREMENTS

CRANIA

The Cupisnique series (8 males, 5 females) is too small to warrant drawing conclusions from the average measurements. The Mochica series (13 males, 8 females), although nearly twice as large, is still too small to give more than general indications.[4] In view of this situation I have given in table 2 the averages for these two series in comparison with the miscellaneous undeformed series from the Chicama Valley described above (page 156). Since this miscellaneous series consists of 50 individuals for each sex, its averages may be considered fairly reliable.

Examination of the differences between the Mochica and the miscellaneous Chicama series shows that the mean measurements do not differ more than 2 mm. in the males and 6 mm. in the females, the average difference between the means being slightly over 1 mm. in the males and slightly under 2 mm. in the females. In the case of the six indices the average difference between the means is 1.3 units for the males and 2.3 units for the females. When the small number in the Mochica series is considered, these figures indicate a fair degree of similarity.

Although the means of these two series may show considerable resemblance, it is important also to consider the variability of all the undeformed skulls. In other words, restating the first problem listed above, how do the undeformed skulls from the Chicama-Moche-Virú region represented in these collections compare in homogeneity with other populations?

A convenient measure of variability is furnished by Howells's "mean sigma" (1941), but this is based entirely upon European series. There are only a few standard deviations available for series of American Indians and especially those from single sites or single cultures. However, from the available data I have selected three series that furnish interesting comparisons (table 3). Unfortunately, none of these is from South America. The Pecos series is interesting because it represents the undeformed and least-deformed elements from a single site; the Southern Shell Mound and Arikara series, on the other hand, represent a single culture or a single tribe as found in more than one site.

Before considering this comparison in detail, we may note that the metrical variability of a cranial series may be exaggerated by the unintentional inclusion of individuals of the other sex and of slightly deformed specimens. The difficulty of correctly sexing skulls

[4] Measurements of the individual specimens of both series are given in the appendix.

TABLE 2.—*Craniometric comparisons*[1]

Measurements (in mm.) and indices	Chupisnique		Mochica		Miscellaneous Chicama	
MALES						
Diam. ant.-post. max.	(4)	17. 4	(11)	17. 7	(50)	17. 5
Diam. lat. max.	(4)	14. 5	(11)	13. 7	(50)	13. 9
Bas.-breg. height	(6)	13. 6	(11)	13. 6	(50)	13. 5
Cranial index	(4)	*83. 6*	(11)	*77. 4*	(50)	*79. 8*
Mean ht. index	(2)	*85. 2*	(10)	*86. 8*	(50)	*85. 8*
Cranial module	(6)	15. 2	(10)	15. 0	(50)	15. 0
Diam. front. min.	(8)	[2] 9. 7	(12)	9. 1	(50)	9. 2
Alv. pt.-nasion	(6)	6. 8	(12)	6. 6	(43)	6. 8
Diam. biz. max.	(2)	[2] 13. 8	(11)	13. 4	(42)	13. 6
Facial index, upper	(2)	[2] *47. 3*	(10)	*48. 7*	(35)	*50. 3*
Endobas.-nasion	(6)	10. 1	(11)	10. 0	(50)	10. 0
Endobas.-subnas. pt.	(6)	8. 8	(11)	8. 8	(50)	8. 9
Endobas.-prealv. pt.	(6)	10. 3	(10)	9. 8	(45)	10. 0
Facial angle	(6)	69. 0°	(11)	72. 0°	(43)	70. 0°
Alveolar angle	(6)	44. 5°	(11)	51. 5°	(43)	51. 0°
Orbital ht. mean	(6)	3. 3	(13)	3. 3	(50)	3. 4
Orbital br. mean	(6)	3. 9	(13)	3. 7	(49)	3. 8
Orbital index mean	(6)	*84. 6*	(13)	*88. 8*	(49)	*89. 1*
Nasal height	(6)	4. 9	(13)	4. 8	(50)	4. 9
Nasal breadth	(6)	2. 4	(12)	2. 4	(49)	2. 4
Nasal index	(6)	*50. 1*	(12)	*49. 1*	(49)	*49. 9*
Upper alv. arch length	(5)	5. 6	(11)	5. 4	(41)	5. 4
Upper alv. arch breadth	(4)	6. 6	(10)	6. 4	(35)	6. 4
Upper alv. arch index	(4)	*117. 8*	(10)	*120. 2*	(35)	*118. 5*
FEMALES						
Diam. ant.-post. max.	(1)	17. 3	(8)	17. 0	(50)	16. 8
Diam. lat. max.	(1)	12. 9	(8)	13. 4	(50)	13. 6
Bas.-breg. height	(2)	12. 6	(6)	12. 8	(50)	12. 9
Cranial index	(1)	*74. 6*	(8)	*79. 2*	(50)	*81. 2*
Mean ht. index	(2)	*82. 4*	(6)	*84. 8*	(50)	*85. 0*
Cranial module	(1)	14. 6	(6)	14. 4	(50)	14. 4
Diam. front. min.	(4)	[2] 9. 1	(8)	9. 0	(50)	8. 9
Alv. pt.-nasion	(4)	6. 2	(4)	6. 8	(46)	6. 5
Diam. biz. max.	(2)	[2] 13. 2	(4)	12. 8	(46)	12. 7
Facial index, upper	(2)	[2] *47. 0*	(4)	*52. 8*	(43)	*51. 1*
Endobas.-nasion	(2)	9. 2	(6)	9. 8	(50)	9. 5
Endobas.-subnas. pt.	(1)	8. 6	(4)	8. 9	(50)	8. 5
Endobas.-prealv. pt.	(1)	10. 0	(4)	10. 2	(46)	9. 6
Facial angle	(1)	66. 5°	(4)	68. 0°	(46)	69. 5°
Alveolar angle	(1)	44. 0°	(4)	49. 5°	(46)	50. 5°
Orbital height mean	(4)	3. 1	(4)	3. 4	(50)	3. 4
Orbital breadth mean	(4)	3. 6	(4)	3. 8	(50)	3. 7
Orbital index	(4)	*84. 6*	(4)	*91. 0*	(50)	*91. 4*
Nasal height	(4)	4. 5	(4)	4. 6	(50)	4. 7
Nasal breadth	(4)	2. 4	(4)	2. 4	(49)	2. 4
Nasal index	(4)	*54. 8*	(4)	*51. 3*	(49)	*50. 6*
Upper alv. arch length	(3)	5. 0	(4)	5. 5	(43)	5. 2
Upper alv. arch breadth	(2)	5. 8	(2)	6. 0	(37)	6. 1
Upper alv. arch index	(2)	*117. 0*	(2)	*107. 2*	(36)	*116. 2*

[1] Measurements obviously altered by deformity not included (see Appendix for individual measurements).
[2] Probably altered by deformity.

increases when they are isolated from the skeleton. This factor probably plays a part in the Peruvian series. As for deformity, no one can be sure of entirely excluding it, because there is then the danger of going too far and removing true brachycranic individuals. As others have noted (see Stewart, 1940), the Pecos series includes a good number of slightly deformed skulls, which fact is reflected in the high sigmas for the vault diameters and indices. Then, for our purposes, the Shell Mound and Arikara series, being largely sexed from the skeleton and being completely free from deformity, furnish the best check on variability.

TABLE 3.—*Comparative standard deviations: Males*

Measurements and indices	Combined Peruvians [1]		Pecos [2]		Southern Shell Mounds [3]		Arikara [4]	
Diam. ant.-post. max	(65)	6. 01	(46)	8. 15	(54)	5. 41	(51)	5. 20
Diam. lat. max	(65)	5. 46	(45)	6. 14	(55)	4. 92	(51)	4. 27
Bas.-breg. height	(63)	4. 63	(34)	6. 49	(28)	3. 86	(50)	4. 95
Cranial index	(65)	4. 44	(13)	4. 81	(52)	3. 24	(51)	3. 20
Cranial module	(62)	3. 60	(33)	5. 08	(27)	2. 99	(52)	3. 17
Diam. front. min	(66)	4. 54	(50)	6. 27	(54)	4. 55		
Alv. pt.-nasion	(57)	2. 88	(112)	3. 95	(33)	3. 57	(51)	3. 43
Diam. biz. max	(55)	4. 79	(102)	6. 17	(21)	5. 27	(52)	4. 49
Facial index, upper	(47)	2. 46	(90)	3. 28			(50)	2. 85
Endobas .nasion	(63)	3. 94	(27)	3. 78	(28)	3. 10		
Endobas.-prealv. pt	(57)	4. 98	(25)	3. 38				
Orbital ht., left	(58)	1. 65	(117)	1. 60			(43m)	1. 98
Orbital br., left	(59)	1. 70	(117)	1. 89			(43m)	1. 13
Orbital index, mean	(64)	4. 21	(120)	4. 57			(43)	4. 53
Nasal height	(65)	2. 31	(125)	2. 74	(39)	2. 61	(53)	2. 11
Nasal breadth	(63)	1. 67	(126)	1. 57	(34)	2. 12	(53)	1. 77
Nasal index	(63)	3. 94	(124)	4. 27	(32)	3. 83	(53)	3. 63
Upper alv. arch length	(54)	2. 72	(100)	2. 82				
Upper alv. arch breadth	(46)	3. 07	(97)	3. 29				
Upper alv. arch index	(46)	6. 10	(97)	6. 42				

[1] Cupisnique, Mochica, and Miscellaneous Chicama (see table 2).

[2] Hooton (1930). Total series A: 50 or less individuals represent the "undeformed" subseries; higher numbers include deformed skulls.

[3] Newman and Snow (1942). Total Shell Mound Series, table 27.

[4] Von Bonin and Morant (1938), table 12. The figures for cranial module and upper facial index have been supplied by the author.

In examining table 3 we see that the Peruvians show about the same variability as the Arikara and Shell Mound series, except chiefly in the cranial index and the length and breadth of the skull. There seems to be good reason to believe, therefore, that this unnatural variability of the vault diameters, as in the case of the Pecos group, is caused by the inclusion of a few slightly deformed individuals. We may note that Howells (1941) reports a "mean sigma" for the cranial index of 3.22 for 23 European series, and von Bonin and Morant (1938) give 3.12 for 14 North American Indian series comprising 1,073 skulls.

These findings have suggested to me that by removing the most brachycranic and presumably slightly deformed skulls from the "undeformed" Peruvian series, until a more natural variability is obtained, I could obtain a truer undeformed range, as well as a truer mean. Acting on this thought, I have reduced arbitrarily the male range from 68.2–90.5 to 68.2–82.6. This deletion results in the following distribution:

Class	*New series*	*Removed*
65–69.9	1	--
70–74.9	7	--
75–79.9	25	--
80–84.9	17	8
85–89.9	--	6
90–94.5	--	1
Total	50	15

The new series gives a standard deviation of 3.29 for the cranial index and a mean of 77.8. The length then becomes 177 mm. (S. D. 5.53) and the breadth 138 mm. (S. D. 4.62). These means are close to those of the Mochica series given in table 2 and probably approximate the true undeformed type.

Since we have definite evidence now from this northern coastal region that cranial deformity is linked with culture, it is desirable to know whether the custom of deforming the head was introduced without a physical change in population, or whether there was a population replacement by a physically different people who practiced this custom. This is the second problem listed above. In attempting to solve this I have measured a series of 50 deformed Chicama Valley skulls of each sex for additional comparison with the miscellaneous undeformed series. The measurements have been restricted to those that I have assumed to be least affected by deformity, which means chiefly facial measurements. In table 4 I give the differences between the means of these two series together with their probable errors and × p. e.'s.

Of the 12 measurements and indices here listed, 6 show higher and 4 show lower means for the deformed group in both sexes. The two remaining measures show very small differences that vary in opposite directions in the two sexes. Two of the higher means in the males and three in the females appear to be significantly different; that is, they exceed three times their probable errors. It is noteworthy as regards the higher measurements in the deformed group that face height and orbital height are increased significantly in both sexes, while there is also an increase in nose height in both sexes that approaches significance at least in the males. This increase in the absolute heights of the face, orbits, and nose cannot be reconciled with the type of deformity present.

TABLE 4.—*Metrical differences (mm.) between deformed and undeformed crania: Miscellaneous Chicama*

Deformity	No.	Range	Mean±p. e.	×p. e.
MALES				
ALVEOLAR POINT-NASION				
Undeformed	57	62–75	67. 53±0. 26	
Deformed	49	63–77	70. 00±0. 32	
Difference			2. 47±0. 41	6. 02
ENDOBASION-NASION				
Undeformed	63	92–109	100. 24±0. 33	
Deformed	54	87–105	97. 76±0. 35	
Difference			2. 48±0. 48	5. 17
ENDOBASION-PREALVEOLAR POINT				
Undeformed	57	88–108	100. 60±0. 44	
Deformed	50	90–110	98. 74±0. 43	
Difference			1. 26±0. 62	2. 03
ORBITAL HEIGHT, LEFT				
Undeformed	58	30–37	33. 53±0. 15	
Deformed	52	31–39	34. 58±0. 15	
Difference			1. 05±0. 21	5. 00
ORBITAL BREADTH, LEFT				
Undeformed	59	33–41	37. 71±0. 15	
Deformed	50	35–42	38. 24±0. 16	
Difference			0. 53±0. 21	2. 52
ORBITAL INDEX, MEAN				
Undeformed	64	79. 0–101. 8	89. 01±0. 36	
Deformed	54	77. 8–100. 0	90. 39±0. 14	
Difference			1. 38±0. 57	2. 51
NASAL HEIGHT				
Undeformed	65	44–53	48. 60±0. 19	
Deformed	54	45–57	49. 35±0. 22	
Difference			0. 75±0. 29	2. 59

TABLE 4.—*Metrical differences (mm.) between deformed and undeformed crania: Miscellaneous Chicama*—Continued

Deformity	No.	Range	Mean±p. e.	×p. e.
MALES—Continued				
NASAL BREADTH				
Undeformed	63	21–28	24. 27±0. 14	
Deformed	54	20–27	23. 54±0. 14	
Difference			0. 73±0. 20	3. 65
NASAL INDEX				
Undeformed	63	42. 3–60. 0	49. 95±0. 34	
Deformed	54	41. 7–58. 7	47. 75±0. 32	
Difference			2. 31±0. 47	4. 91
UPPER ALVEOLAR ARCH LENGTH				
Undeformed	54	49–60	54. 28±0. 25	
Deformed	49	49–59	54. 35±0. 22	
Difference			0. 07±0. 33	0. 21
UPPER ALVEOLAR ARCH BREADTH				
Undeformed	46	59–73	64. 26±0. 30	
Deformed	45	59–73	65. 20±0. 29	
Difference			0. 94±0. 42	2. 24
UPPER ALVEOLAR ARCH INDEX				
Undeformed	46	108. 5–134. 0	118. 71±0. 61	
Deformed	44	111. 3–134. 6	120. 15±0. 57	
Difference			1. 44±0. 83	1. 73
FEMALES				
ALVEOLAR POINT-NASION				
Undeformed	52	57–75	65. 00±0. 36	
Deformed	51	59–72	66. 39±0. 27	
Difference			1. 39±0. 45	3. 09
ENDOBASION-NASION				
Undeformed	57	91–103	95. 62±0. 25	
Deformed	51	86–98	91. 51±0. 30	
Difference			4. 11±0. 39	10. 54

TABLE 4.—*Metrical differences (mm.) between deformed and undeformed crania: Miscellaneous Chicama*—Continued

Deformity	No.	Range	Mean±p. e.	×p. e.
FEMALES—Continued				
ENDOBASION-PREALVEOLAR POINT				
Undeformed	50	91–107	97. 02±0. 34	
Deformed	47	88–106	94. 19±0. 33	
Difference			2. 83±0. 47	6. 02
ORBITAL HEIGHT, LEFT				
Undeformed	55	30–37	33. 66±0. 14	
Deformed	52	31–37	34. 44±0. 14	
Difference			0. 78±0. 20	3. 99
ORBITAL BREADTH, LEFT				
Undeformed	54	34–41	36. 82±0. 12	
Deformed	52	34–41	36. 60±0. 13	
Difference			0. 22±0. 18	1. 22
ORBITAL INDEX, MEAN				
Undeformed	56	78. 4–100. 0	91. 31±0. 39	
Deformed	52	85. 1–101. 4	93. 20±0. 33	
Difference			1. 89±0. 51	3. 71
NASAL HEIGHT				
Undeformed	56	42–53	46. 55±0. 23	
Deformed	52	41–51	47. 02±0. 20	
Difference			0. 47±0. 30	1. 57
NASAL BREADTH				
Undeformed	55	20–28	23. 69±0. 16	
Deformed	52	20–27	23. 10±0. 14	
Difference			0. 59±0. 21	2. 81
NASAL INDEX				
Undeformed	55	43. 5–58. 7	50. 88±0. 37	
Deformed	52	40. 8–60. 0	49. 22±0. 35	
Difference			1. 66±0. 51	3. 26

TABLE 4.—*Metrical differences (mm.) between deformed and undeformed crania: Miscellaneous Chicama*—Continued

Deformity	No.	Range	Mean±p. e.	Xp. e.
FEMALES—Continued				
UPPER ALVEOLAR ARCH LENGTH				
Undeformed	49	48–58	52. 51±0. 25	
Deformed	48	48–59	52. 08±0. 26	
Difference			0. 43±0. 36	1. 19
UPPER ALVEOLAR ARCH BREADTH				
Undeformed	40	55–67	60. 96±0. 29	
Deformed	47	55–66	61. 38±0. 25	
Difference			0. 42±0. 38	1. 10
UPPER ALVEOLAR ARCH INDEX				
Undeformed	39	103. 4–127. 1	115. 82±0. 66	
Deformed	45	103. 8–129. 2	117. 98±0. 60	
Difference			2. 16±0. 89	2. 43

Of the four lower means in the deformed group, two—endobasion-nasion, endobasion-prealveolar point—probably can be explained by the deformity.[5] The decrease in endobasion-nasion is significant statistically in both sexes, and that for endobasion-alveolar point is significant at least in the females. The decrease in nasal breadth and the lowering of the nasal index, which also are statistically significant in both sexes (except for nasal breadth in the female, which approaches significance), are contrary to the general broadening of the face that might be expected from the deformity.

Thus it seems to me that the lengthening of the face and narrowing of the nose in the deformed group, being contrary to changes that might be expected from the type of deformity present, and being statistically significant, indicate a true physical difference between the two populations. Moreover, the deformed sample seems to be somewhat more homogeneous than the undeformed, if we can judge by the standard deviations of the facial measurements shown in table 5.

[5] Shapiro's attempt (1928) to find "a correction for artificial deformity of skulls" is based on the assumption that basion-nasion is unaffected by deformity. In support of this premise he cites figures for two Patagonian series, two Middle Mississippi cultural groups from Ohio and Tennessee, and the Pecos series. It is quite unlikely that the degree of deformity in any of these groups equals that in the Peruvians under consideration, especially as it affects the base of the skull. The circular deformity of the Patagonians would not alter the cranial base as much as the occipital flattening of the Pueblos, but the latter even is less extreme in this respect than would be expected owing to its frequently asymmetrical character.

TABLE 5.—*Standard deviations of measurement least affected by deformity*

Measurements and indices	Male		Female	
	Undeformed	Deformed	Undeformed	Deformed
Alv. pt.-nasion	(57) 2. 88	(49) 3. 27	(32) 3. 88	(51) 2. 83
Endobas.-nasion	(63) 3. 94	(54) 3. 77	(57) 2. 82	(51) 3. 15
Endobas.-prealv. pt	(57) 4. 98	(50) 4. 47	(50) 3. 59	(47) 3. 37
Orbital ht., left	(58) 1. 65	(52) 1. 64	(55) 1. 49	(52) 1. 55
Orbital br., left	(59) 1. 70	(50) 1. 71	(54) 1. 33	(52) 1. 42
Orbital index, mean	(64) 4. 21	(54) 4. 85	(56) 4. 34	(52) 3. 50
Nasal height	(65) 2. 31	(54) 2. 38	(56) 2. 59	(52) 2. 10
Nasal breadth	(63) 1. 67	(54) 1. 55	(55) 1. 73	(52) 1. 55
Nasal index	(63) 3. 94	(54) 3. 50	(55) 4. 06	(52) 3. 73
Upper alv. arch length	(54) 2. 72	(49) 2. 25	(49) 2. 59	(48) 2. 62
Upper alv. arch breadth	(46) 3. 07	(45) 2. 90	(40) 2. 72	(47) 2. 54
Upper alv. arch index	(46) 6. 10	(44) 5. 59	(39) 6. 12	(45) 6. 03

LONG BONES

Some long bones were present in 12 individuals from the Cupisnique group, but in only 3 Mochicas. As a result, when the measurements are subdivided according to sex and side, the greatest number in one group is 5. Owing to these small numbers and the lack of suitable comparative data, I have preferred to give the individual measurements rather than averages (tables 6–8). However, for the femur (table 7) I have included Hrdlička's (1938) averages on a miscellaneous Chicama series. This series differs from that given in connection with the skull in that it represents the total population of the valley and not just that part practicing, or not practicing, deformation.

Because the culturally dated material is so scanty, it is impossible to determine whether the Cupisnique and Mochica peoples differed in stature. It will be useful, however, in connection with the subsequent discussion to know the approximate stature of these peoples. The best figures are perhaps obtained from Hrdlička's femur and tibia lengths[6] with the aid of Pearson's formula *e* (1898); namely, 159.4 cm. for males and 147.7 for females.

[6] I am indebted to Dr. Hrdlička for supplying me with the tibial length of the Chicama series from his manuscript: Average for 200 male right, 34.76 cm.; 150 female right, 31.97 cm.

TABLE 6.—*Individual measurements (cm.) of the upper extremity bones*

No.	Humerus: Lt. max.	Humerus: Diam. max. at middle	Humerus: Diam. min. at middle	Humerus: Index of shaft	Radius: Lt. max.	Ulna: Lt. max.	Clavicle: Lt. max.
CUPISNIQUE, MALE RIGHT							
CU 4	------	------	------	------	24. 0	25. 4	13. 1
CU 5	30. 7	2. 0	1. 7	*85. 0*	------	------	--------
CU 7	30. 4	2. 1	1. 7	*81. 0*	------	------	15. 9
CU 10	--------	--------	--------	------	------	------	13. 6
CU 12	------	------	------	------	------	------	14. 8
CU 13	28. 1	1. 9	1. 6	*84. 2*	21. 2	------	12. 8
MOCHICA, MALE RIGHT							
M 16	30. 6	2. 1	1. 5	*71. 4*	------	------	--------
M 19	--------	--------	--------	------	------	------	13. 6
CUPISNIQUE, MALE LEFT							
CU 4	29. 3	1. 8	1. 5	*83. 3*	------	24. 8	13. 5
CU 5	30. 1	2. 1	1. 5	*71. 4*	------	------	15. 9
CU 7	--------	--------	--------	------	23. 1?	------	--------
CU 12	--------	--------	--------	------	21. 5	------	--------
CU 13	--------	--------	--------	------	------	------	12. 7
MOCHICA, MALE LEFT							
M 16	29. 7	2. 1	1. 5	*71. 4*	------	------	14. 7
M 19	--------	--------	--------	------	------	24. 0	13. 4
CUPISNIQUE, FEMALE RIGHT							
CU 1	------	------	------	------	21. 5	------	--------
CU 3	27. 6	1. 9	1. 4	*73. 7*	------	------	13. 2
CU 9	27. 3	1. 6	1. 6	*100. 0*	20. 3	21. 6	12. 7
CUPISNIQUE, FEMALE LEFT							
M 1	27. 9	1. 6	1. 2	*75. 0*	21. 5	------	13. 3
M 3	27. 4	1. 8	1. 4	*77. 8*	20. 4	------	13. 2
M 9	26. 8	1. 6	1. 4	*87. 5*	20. 3	------	13. 0
M 11	--------	--------	--------	------	19. 0	------	--------

TABLE 7.—*Individual measurements (cm.) of the femur compared with averages for a Miscellaneous Chicama series*

No.	Lt. max.	Lt. bicond.	Diam. a.-p. at middle	Diam. lat. at middle	Index of shaft	Diam. max. upper flat.	Diam. min. upper flat.	Platymeric index
CUPISNIQUE, MALE RIGHT								
CU 4	------	38. 8	2. 4	2. 4	*100. 0*	3. 0	2. 1	*70. 0*
CU 5	40. 2	40. 0	2. 5	2. 5	*100. 0*	3. 1	2. 2	*71. 0*
CU 10	41. 7	41. 3	2. 6	2. 5	*96. 2*	3. 3	2. 3	*69. 7*
CU 13	38. 7	38. 4	2. 7	2. 3	*85. 2*	2. 7	2. 3	*85. 2*
MOCHICA, MALE RIGHT								
M 19	------	40. 2	2. 5	2. 4	*96. 0*	3. 0	2. 2	*73. 3*
MISCELLANEOUS CHICAMA, MALE RIGHT[1]								
----------	41. 3	40. 9	2. 7	2. 7	*99. 6*	3. 3	2. 3	*69. 6*
CUPISNIQUE, MALE LEFT								
CU 2	38. 2	37. 9	2. 3	2. 1	*91. 3*	2. 8	1. 9	*67. 8*
CU 5	39. 9	39. 7	2. 5	2. 7	*108. 0*	3. 3	2. 2	*66. 7*
CU 8	39. 6	39. 4	2. 7	2. 4	*88. 9*	2. 8	2. 2	*78. 6*
CU 10	41. 8	41. 3	2. 6	2. 4	*92. 3*	3. 4	2. 3	*67. 6*
CU 13	38. 7	38. 5	2. 7	2. 4	*88. 9*	2. 8	2. 4	*85. 7*
MISCELLANEOUS CHICAMA, MALE LEFT								
----------	41. 8	41. 4	2. 7	2. 7	*100. 4*	3. 3	2. 3	*69. 7*
CUPISNIQUE, FEMALE RIGHT								
CU 1	38. 4	37. 9	2. 4	2. 2	*91. 7*	2. 6	2. 0	*76. 9*
MOCHICA, FEMALE RIGHT								
M 18?	41. 9	41. 6	2. 9	2. 4	*82. 8*	2. 9	2. 2	*75. 9*
MISCELLANEOUS CHICAMA, FEMALE RIGHT								
----------	37. 8	37. 4	2. 3	2. 3	*100. 9*	2. 8	2. 0	*68. 5*
CUPISNIQUE, FEMALE LEFT								
CU 1	38. 9	38. 3	2. 4	2. 2	*91. 7*	2. 5	1. 9	*76. 0*
CU 9	37. 6	37. 2	2. 3	2. 0	*87. 0*	2. 4	1. 9	*79. 2*
MISCELLANEOUS CHICAMA, FEMALE LEFT								
----------	37. 9	37. 4	2. 3	2. 3	*101. 8*	2. 8	2. 0	*69. 4*

[1] Hrdlička, 1938. Males: 200 right, 200 left; females: 200 right, 150 left.

TABLE 8.—*Individual measurements (cm.) of the tibia and fibula*

No.	Tibia				Fibula: Lt. max.
	Lt. in position	Diam. a.-p. at middle	Diam. lat. at middle	Index of shaft	
CUPISNIQUE, MALE RIGHT					
CU 8	34. 0	3. 0	2. 1	*70. 0*	----
CU10	35. 4	2. 8	1. 9	*67. 8*	34. 6
CUPISNIQUE, MALE LEFT					
CU 4	34. 6	2. 8	2. 1	*75. 0*	----
CU 5	33. 6	3. 0	1. 8	*60. 0*	32. 8
CU 8	33. 9	3. 1	2. 1	*67. 7*	----
CU10	35. 0	2. 8	1. 9	*67. 8*	----
CU13	31. 5?	2. 9	2. 2	*75. 9*	----
MOCHICA, MALE LEFT					
M19	32. 6	3. 0	1. 7	*56. 7*	----
CUPISNIQUE, FEMALE RIGHT					
CU 1	32. 9	2. 4	1. 8	*75. 0*	----
CU 9	----	----	----	----	29. 2
CU11	29. 3	2. 5	1. 8	*72. 0*	28. 3
CUPISNIQUE, FEMALE LEFT					
CU 9	31. 1	2. 3	1. 8	*78. 3*	----
CU11	29. 4	2. 5	1. 8	*72. 0*	----

DISCUSSION

The foregoing analysis of the skeletal remains of two culturally distinct populations from the north coast of Peru emphasizes the fact that the only demonstrable morphological difference between them is based upon the presence or absence of cranial deformity. Partly, of course, this similarity may be due to the small number of specimens available, for certain suggestive differences do appear to distinguish the whole collection of deformed and undeformed crania of the Chicama Valley. For the present, therefore, these data on culturally identified skeletons are of value for this indication, since heretofore there has been a lack of even this much information.

In analyzing the culturally identified material I have introduced measurements on a larger and probably statistically adequate series of undeformed crania from the Chicama Valley, and have shown that it is fairly homogeneous. Unfortunately, we can never know the cul-

tural composition of this series; still it can serve for comparisons with other undeformed populations as data thereon become available. Since such data are not yet available from Peru, I have not considered it necessary at this time to make extensive comparisons beyond this area.[7]

In this connection, possibly because of being a North American working with South American materials, I should like to examine a statement to which rather frequent reference has been made in the recent Latin American literature, namely, that the Old Peruvians and the Pueblos of Arizona and New Mexico are of one and the same physical type. The current advocate of this generalization is Imbelloni (1938), but the idea appears to have been initiated by ten Kate (1894). As far as I can discover no one has supported with figures the claimed unity and distribution of this physical type.

First, let us consider the claims. Ten Kate, because of his experiences in Mexico and our Southwest, was struck by certain ethnographic resemblances to this region when he visited the provinces of Catamarca, Tucumán, and Salta in Argentina (1894). However, it was not until 1896, when he published his report on the skeletal remains of the Calchaqui, that he called attention to the physical resemblances. He says (p. 62):

[7] Since this was first written Dr. M. T. Newman has kindly permitted me to read and quote from his manuscript entitled "Indian Skeletal Material from the Central Coast of Peru; an Archeologically Oriented Study in Physical Anthropology." Rather than attempt to synthesize fully his and my findings, I shall call attention merely to some points that are of especial interest here.

Doctor Newman has assembled four series of crania, each from a different period and a different valley and varying in number from 14 to 41. Although certain differences are detected from period to period, they are not extensive or constant, and Doctor Newman believes that he is dealing primarily with only one physical type. This type, it should be noted, is brachycranic. The cranial indices of all the undeformed males give the following frequency distribution in relation to that for the Chicama Valley (see p. 163):

Class	*Central Coast*	*Chicama Valley*
65–69.9	—	1
70–74.9	4	7
75–79.9	9	25
80–84.9	42	25
85–89.9	20	6
90–94.9	4	1
	79	65

According to these distributions, and in spite of the inclusion in both series of some slightly deformed individuals, there appears to be a distinctly greater tendency toward brachycrany on the central coast.

As for fronto-occipital deformity, Doctor Newman found it to be present in practically all his earliest or "Shell Mound" crania. In the Early (Interlocking Style) Period the incidence falls to about one-third, but in the Middle Period it increases to about two-thirds. Finally, in the Late Period intentional deformity almost disappears, and the great majority of the crania are either undeformed or show slight to moderate posterior flattening. This situation seems to parallel that in the Chicama-Moche-Virú region, where intentional deformity is present in the Cupisnique period, disappears in the subsequent Mochica period, and reappears later only to taper off ultimately.

In leaving South America in order to search farther nortl. for affinities or resemblances, our thought is arrested involuntarily first of all at central Mexico, then finally at the plains and canyons of Arizona and New Mexico. There are above all the crania from ancient sepulchers of Santiago Tlaltelolco described by Hamy [1891], which by their general morphology, their strong brachycephaly and the high indices of the orbit and nose recall certain types of our Calchaqui series. The practice of entering the flexed body in pottery vessels was likewise followed by this ancient population, a custom which, as Hamy remarks, was, with numerous variations, adopted by a great many American tribes, without indicating by that necessarily an ethnic affinity. As for the Saladoans and Cibolans [Matthews, 1891], representatives of the ancient civilization known as Shiwi, which I have compared so many times with the Calchaquis, there remains only to recall their excessive brachycephaly, their small stature, their free hyoid bones, and finally the mythico-religious and mythico-sociologic analogies, which must exist in these two civilizations at their extreme limits and which I have already summarized elsewhere some years ago [1894].

When we examine the "excessive brachycephaly" referred to here we find that it is largely, if not entirely, due to artificial deformity. Thus, ten Kate reports (1896, p. 31) that 60 percent of his Calchaqui skulls are definitely deformed and many others show asymmetry (plagiocephaly). He says further (p. 32) that the frontal bone is commonly flattened and that the resulting deformity type is like that from Trujillo, Peru.[8] We may suspect deformity also in the case of Hamy's six crania from Santiago Tlaltelolco, Mexico, since the cranial indices range from 81 to 91. As for Matthews' Pueblos, he says quite frankly:

> The occipital flattening here referred to, must be carefully distinguished from that produced intentionally by the ancient Peruvians, by the Flatheads of our Northwest coast, and by other races. In the latter there is an anterior counter-flattening produced by the pressure applied to the forehead; in the former there is no frontal flattening (p. 173).
>
> There are 16 skulls which, if never seen in connection with the rest of the collection, might readily be regarded as normal skulls. Taken by themselves, the fact that they are deformed is not obvious; studied along with the rest of the group, where there is every gradation from the most unquestionably flattened to the apparently normal, the observer has no doubt that the causes which operated in distorting the former class have had their effect too in shaping the latter, and he feels uncertain where, in any shortened skulls, he is to draw the dividing line between the normal and the abnormal (p. 178).

Independently of ten Kate, and on the sole basis of a trip around the world that did not include South America or our Southwest, Bonarelli (1909) related the Pueblos and Andean peoples in a classification of mankind. The whole matter is disposed of in the following brief statement (p. 963):

> I call by the name "Pueblo-Andinian" the population inhabiting the more or less mountainous parts of Arizona, Colorado, New Mexico, Central America,

[8] Cf. also Virchow, 1892, p. 11.

and the Andes Mountains of South America (Mochi, Pueblos, Apaches, Peruvians, Araucanians, Tehuelchi or Patagonians, etc.) These peoples present generally an extreme similarity between male and female physiognomies, cranium similarly brachycephalic, very broad face with rounded chin.

Von Eickstedt's classification of 1933, while not combining North and South American groups, nevertheless indicates certain similarities and differences, especially as between the groups here under discussion. It will be noted that his arrangement is based almost entirely on the living; thus, he says (pp. 721–724):

Before we turn to the treatment of the remains and the diffusion of these four South American races, let us note, if only for nemotechnical reasons, the very clear connection between area and race. The four regions of the southern continent are as follows: (1) The extended chain of the Andean Mountains on the west coast, (2) the broad tablelands in the southeastern part terminating in a point to the south, (3) the large forest-covered basin of the Amazon in the interior of Brazil, and finally (4) the Brazilian mountainous area in the east. To these correspond respectively the above mentioned races of the (1) Andids, (2) Pampids, (3) Brazilids, and (4) Lagids, if we overlook for the moment slight overlappings and displacements.

Moreover, there is remarkable agreement between the large groups of Hominidae in North and South America. Here as there we have four races, and even two round- and two long-headed races in each. Here as there the round-headed races inhabit either the mountains (Andids and Pacifids) or the south (Pampids and Centralids); whereas the long-heads dwell in the northern forests (Brazilids and Silvids) or as older strata on the marginal areas (Lagids and Margids). This is of course no accident.

Andids.—The arc of the western and central round-headed races of North America is continued on South American territory in the race of the Andids which, directly adjoining the Centralids,[9] occupies the long range of the Andes. Just as the Centralids are the culture-race of the North, so are the Andids that of the South. But where the generally higher culture of the Centralids has only succeeded to a slight degree—if in itself of note—in producing realistic likenesses of human beings, the Andids, especially of the Pre-Incan era (Proto-Chimu culture), became masters of the art of reproducing the human features. . .

In physical types the Andids are medium round-headed, short to moderately long-faced, and rather short statured, being quite similar to the neighboring Centralids in that respect, as even d'Orbigny [1839] had already observed. But the features themselves are essentially different. The lines are marked, sharply drawn; the nose long, often aquiline and very prominent; and the cheek bones very prominent. The shape, however, is short and plump. There is therefore nothing of the Centralid delicacy and almost European configuration of the face. . .

Finally, Imbelloni (1938) has sought to improve upon the foregoing classifications, and particularly that of von Eickstedt. In addition to substituting a geographical terminology, Imbelloni has divided von

[9] According to von Eickstedt the area occupied by the Centralids includes the Pueblo region, Gulf States, parts of Mexico, and Central America.

Eickstedt's Centralid group and combined the Pueblo portion with the Andean: Pueblo-Andid. The remaining portion, which embraces the peoples of southern Mexico, the Isthmus and adjoining parts of Colombia, he regards as a separate subdivision and gives to it the name "Isthmid."[10] Of the Pueblo-Andid group he says in part (pp. 235–236):

Habitat.—What will draw attention to my map is the discontinuous character of the area, whose two sections, one of the northern continent and the other of South America, are separated by a wide gap. We shall see, in speaking of the Isthmids, that this discontinuity of the total area is to be interpreted as a recent phenomenon in the ethnographic history of America, and that the two sections are to be understood as originally connected. The northern part, or that of the Pueblos, comprehends all the territory in which skeletal remains of the inhabitants of the "stone houses" and "plateaus" and the "cliffs" (Pueblos and cliff-dwellers) have been exhumed, with an archeological trousseau [ajuar] that in its abundance clearly distinguishes them from all the tribes that followed, no less than do physical characteristics, stature, indices, etc. We are dealing with the basins of the Rio Grande, the Colorado, and part of the Gila and Salado rivers, etc., and mountainous, semi-arid regions noted for cacti. The small number of living survivors of this ancient human group cannot give an exact indication of the extension of the original area; they live especially in Arizona and New Mexico, surrounded and almost ignored by the new arrivals: Apache, Navajo, etc. An extension of the brachyoid area of the Pueblos is observable in the section east of the Mississippi; the ancient skulls of Florida attest to the existence of a stratum that later was submerged by the migration of Amazonians coming by way of the arc of the Antilles.

The southern section includes part of Colombia, Ecuador, Peru, Bolivia, northern and central Chile, the Andean region of the Argentine Republic and the Chaco of Santiago.

Diagnosis.—Men of small stature (from 1.59 m. to 1.62 m.). Skull brachymorphic (cephalic index from 81.5 to 89), partly exaggerated by the effects of cranial deformation (both in the northern and the southern area the artificial form "tabular erecta" is frequent; it is absolute in the Pueblos and predominant in the areas in the extreme south of the South American section: Calchaqui and Chaqueños of the Salado River). Small head, especially in the women, but without platycephaly; short face; nose with broad base, but with sufficiently long and salient dorsum; bizygomatic diameter notably large. Torso quite developed in comparison with the limbs; thorax convex. Cutaneous color variable, but with a predominance of intense pigmentation. Body hair sparse; head hair coarse and flat, black; iris obscure.

[10] The two terminologies compare as follows (Imbelloni, 1938):

Von Eickstedt	*Imbelloni*
Eskimid	Subarctid
Pacifid	Columbid
Silvid	Planid
Margid	Sonorid
Centralid	Isthmid
Andid	Pueblo-Andid
Brazilid	Amazonid
Pampid	Pampid
Lagid	Laguid
	Fueguid

These diagnostic characteristics, it will be recognized, are rather indefinite, being derived partly from the living and partly from the skeleton. Moreover, some of these characters, such as broad face, large trunk, deep pigmentation, sparse body hair, and coarse black head hair, are generalized Indian features. Although Imbelloni recognizes the effect of deformity upon the cephalic index, he does not recognize the essential difference in the types of deformity in the two areas, as pointed out by Matthews as long ago as 1891. (See above.)

The data furnished by the present study, together with other recent studies, permit us now to evaluate to a greater extent than heretofore the differences between some of these physical types. In table 9 I have assembled four undeformed cranial series that can be assigned to three of von Eickstedt's groupings. The Peruvians, as we have seen, are distinguished from the Pueblos by von Eickstedt, but united into a single group by Imbelloni. The identification of the Spoon River group (Illinois) as Centralid by Neumann, places it in the same group as the Pueblos according to both classifications. The third physical type, Sylvid of von Eickstedt or Planid of Imbelloni, is furnished by Neumann's identification of the Maples Mills group (Illinois).

TABLE 9.—*Average differences between cranial measurements (mm.) of various Indian types: Males*

Measurements	Miscellaneous Chicama (Andid)[1]	Old Zuñi[2] (Centralid)	Maples Mills[3] (Sylvid)	Spoon River[3] (Centralid)	Differences		
					1–2	3–4	2–4
Maximum number	(50)	(32)	(24)	(27)			
Diam. ant.-post. max	176.8	176.3	182.5	180.1	−0.5	−2.4	+3.8
Diam. lat. max	137.6	132.1	137.4	140.0	−5.5	+2.6	+7.9
Bas.-breg. height	135.1	133.3	141.7	145.6	−1.8	+3.9	+12.3
Cranial index	*77.8*	*74.9*	*75.4*	*77.8*	−2.9	+2.4	+2.9
Mean ht. index	*86.0*	*86.5*	*88.6*[4]	*91.0*[4]	+0.5	+2.4	+4.5
Alv. pt.-nasion	68.2	73.3	75.1	75.0	+5.1	−0.1	+1.7
Diam. biz. max	135.0	133.8	136.5	140.4	−1.2	+3.9	+6.6
Facial index, upper	*50.2*	*54.6*	*54.9*	*53.3*	+4.4	−1.6	−1.3
Endobas.-nasion	100.4	99.5	101.2	105.5	−0.9	+1.3	+6.0
Endobas.-prealv. pt	100.3	98.0	98.8	102.1	−2.3	+3.3	+4.1
Orbital ht. mean	33.9	34.9	35.0	34.4	+1.0	−0.6	−0.5
Orbital br. mean	38.0	37.9	?	?	−0.1	?	?
Orbital index mean	*89.1*	*92.0*	?	?	+2.9	?	?
Nasal height	48.9	51.0	54.0	53.5	+2.1	−0.5	+2.5
Nasal breadth	24.4	25.2	26.1	27.0	+0.8	+0.9	+1.8
Nasal index	*49.9*	*49.3*	*48.5*	*50.4*	−0.6	+1.9	+1.1
Upper alv. arch length	54.3	54.2	54.6	56.7	−0.1	+2.1	+2.5
Upper alv. arch breadth	64.3	64.7	65.7	67.6	+0.4	+1.9	+2.9
Upper alv. arch index	*118.5*	*119.6*	*121.2*	*118.0*	+1.1	−3.2	+1.6
Average difference					1.80	2.06	3.76

[1] Names in parentheses refer to von Eickstedt's classification (1933). For the equivalent terms in Imbelloni's classification (1938), see footnote 10, p. 175.

[2] Hrdlička, 1931, pp. 7–10.

[3] Neumann, 1941b, p. 80.

[4] Calculated from means.

The comparison carried out in table 9 is by means of the simple and probably crude device known as the average difference of the means. This method has been employed by Shapiro and others to call attention to metrical similarities among peoples of the far north (see Stewart, 1939). According to the current interpretation of the average difference, a figure that approaches 2 suggests a doubtful identity of type. From this point of view there is little justification for grouping together the Pueblo and Spoon River groups. On the other hand, the Spoon River and Maples Mills groups are perhaps properly separated as different types. However, if an average difference of 2.06 is sufficient to separate Centralid from Sylvid, it is debatable whether a difference of 1.8 is sufficiently low to warrant the union of the Pueblos and Peruvians.

Viewed from another angle, the first two groups in table 9 represent peoples of small build, whereas the last two groups are of large build. This difference in build is reflected in the high average difference between groups 2 and 4. Now, if instead of comparing sizes we compare shapes, we find that the average differences between the indices are 2.06 (groups 1–2), 2.30 (3–4), and 2.28 (2–4). Thus, the Peruvians are distinguished from the Pueblos by having a distinctly rounder head, broader face, and lower orbits. Both of these groups in turn are distinguished from the remaining two groups chiefly by the difference in relative head height.

The data on stature are also of interest in the present connection. We have seen that male stature in the Chicama Valley, as computed by Pearson's formula *c*, is 159.4 cm. Hooton's data on the Pecos Pueblo (1930) when handled in the same way yield a figure of 162.2. Also, Hooton's data on Madisonville (1920), which Neumann (1941a) has identified as Centralid, give a stature near 167 cm. The Sylvids are probably just as tall as the Madisonville population. Although these figures may be regarded as comparable within the limitations of the series, because they are all calculated in a like manner, they do not entirely accord with the data on the living. Thus, the modern highland male population through Ecuador, Peru, and Bolivia has a stature close to 160 cm. (cf. Gillin, 1941; Hurtado, 1932); the recent Pueblos average 164 cm. (Hrdlička, 1935).

These facts all go to show that the generalization we have been considering is based upon too little knowledge of the physical composition of the American Indians. Although this criticism naturally does not invalidate the general classificatory scheme, nevertheless it casts doubts upon the scale of the differences that distinguish the individual types, as well as their distribution and number.

Everyone will admit that the American Indian is variable in all his physical characters and, furthermore, that some temporal and

geographical segregation of these characters is evident. In spite of this there has been remarkably little effort to define clearly the numerous physical types that have been named. This circumstance introduces an element of subjectivity into the matter and makes it difficult for others to judge the validity of published statements concerning the identification of types. Consequently, the whole science is threatened with a meaningless jargon.

Unfortunately, such classifications have a way of catching the imagination, so whatever misconceptions they introduce are likely to be disseminated widely. Already these types, which grade into one another, are being visualized as distinct entities. This in turn becomes an argument for the polygenesis of the American Indian.

CONCLUSIONS

Having dealt so extensively with a generalization associated with the basic material of this study, it is desirable that all the conclusions be summarized here.

First, I shall point out that the Cupisnique and Mochica skeletal remains, here described for the first time in some detail, are inadequate for satisfactory metrical comparison. The only obvious physical difference between the two groups is the fronto-occipital deformity—a cultural trait registered in bone—which is present in the Cupisnique group alone. However, in view of the scarcity of data on culturally associated skeletal material from Peru, I feel that even the present record is a contribution.

In expanding this study to include the miscellaneous undated skulls from the Chicama-Moche-Virú region, I have attempted to answer two questions: (1) How does the homogeneity of the undeformed series compare with that of other populations? and (2) Were the people who deformed their heads of the same skull type as those who did not follow this custom? The answer to the first of these questions seems to be that the miscellaneous undeformed Chicama series is about as homogeneous as the American undeformed crania available for comparison from one culture or site.

As for the second question, I have concluded that there are certain significant differences between the deformed and undeformed series that are independent of deformity. There is a possibility, therefore, that these differences likewise may distinguish the Cupisnique and Mochica groups.

Finally, I have used the undeformed Chicama series as an example of the Pueblo-Andid physical type, defined by Imbelloni, for the purpose of carrying out metrical comparisons with a representative Pueblo series, as well as with series representing other physical types. My conclusion is that, as it stands now, this classification of American

Indians into several physical types is a generalization based upon rather meager evidence as to their physical make-up. At least until the types are defined better, particularly in reference to skeletal material, and until the distribution and number of types are worked out more clearly, the classification of Indian groups on this basis should not be made an end in itself.

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APPENDIX

MEASUREMENTS (CM.) AND INDICES OF INDIVIDUAL SKULLS[1]

Catalog No.	Locality	Age[2]	Deformation	Diam. ant. post. max.	Diam. lat. max.	Basion-bregma height	Cranial index	Mean height index	Cranial module
CUPISNIQUE, MALE									
CU 2	Barbacoa	M		17.2	14.8		*86.0*		
CU 5	do	Y	Fr.-occ.; asym	(17.0)	(15.6)	12.9	(*91.8*)	(*79.1*)	15.17
CU 7	do	M	Sl. fr.; med. rt. occ.	(17.3)	(14.5)	13.6	(*83.8*)	(*85.5*)	15.13
CU 8	do	M	Med. fr.; med. rt. occ.	(17.0)	(15.2)	14.0	(*89.4*)	(*87.0*)	15.40
CU 10	Santa Ana	M	Sl. lt. occ	17.0	14.4	13.6	*84.7*	*86.6*	15.00
CU 12	Barbacoa	M	Mkd. fr.-occ	(15.9)	(16.0)	13.7	(*100.6*)	(*85.9*)	15.20
CU 13	Santa Ana	O		17.6	14.9	13.6	*84.6*	*83.7*	15.37
CU 14	do	O		17.7	14.0		*79.1*		
CUPISNIQUE, FEMALE									
CU 1	Barbacoa	Y		17.3	12.9		*74.6*		
CU 3	do	M		16.1	14.7	12.9	*91.3*	*83.8*	14.57
CU 6	do	M	Sl. fr.; med. occ	(15.0)	(13.6)		(*90.7*)		
CU 9	Santa Ana	M	Med. fr.; med. lt. occ.	(15.2)	(15.6)		(*102.6*)		
CU 11	Barbacoa	M	Med. fr.; med. occ.	(15.4)	(15.2)	12.4	(*98.7*)	(*81.0*)	14.33
MOCHICA, MALE									
M 1	Salamanca	M		17.6	14.8	13.7	*84.1*	*84.6*	15.37
M 2	do	M		18.9	13.9	14.5	*73.5*	*88.4*	15.77
M 5	do	M		17.8	13.4	13.2	*75.3*	*84.6*	14.80
M 7	do	M				14.2			
M 8	do	M		17.4	13.6		*78.2*		
M 11	Santa Ana	O		18.8	14.2	14.1	*75.5*	*85.4*	15.70
M 12	Ollero	Y		17.7	12.9	13.5	*72.9*	*88.2*	14.70
M 13	Pampa de Carrera	M		17.8?	13.5		*75.8*		
M 14	San Ildefonso Virú	M		16.6	14.0	13.2	*84.3*	*86.3*	14.60
M 15	Barbacoa	O		17.2	14.0	13.8	*81.4*	*88.5*	15.00
M 16	Salamanca	Y	Sl. asym	16.2	13.0	13.2	*80.2*	*90.4*	14.13
M 19	Barbacoa	Y	Sl. post mortem	(16.6)	(14.0)	13.3	(*84.3*)	*86.9*	14.63
M 20	El Brujo	M		18.5	13.1	13.3	*70.8*	*84.2*	14.97
MOCHICA, FEMALE									
M 3	Salamanca	Y		15.9	13.7	12.8	*86.2*	*86.5*	14.13
M 4	Salamanca	Y		17.4	13.9	12.5	*79.9*	*79.9*	14.60
M 6	Barbacoa	M		17.4	13.3	13.0	*76.4*	*84.7*	14.57
M 9	Pampa Chicama[3]	M		16.6	13.3	12.9	*80.1*	*86.3*	14.27
M 10	Santa Ana	M		16.5	12.8	12.6	*77.6*	*86.0*	13.97
M 17	Barbacoa	O		17.4	12.9		*74.1*		
M 18	Barbacoa	O		17.2	13.6		*79.1*		
M 21	?	M		17.2	13.8?	13.2	*80.2*	*85.2*	14.73

[1] For definitions of measurements see Hrdlička, 1939.

[2] Y=young adult; M=middle age; O=old.

[3] Huaca Kidder.

MEASUREMENTS (CM.) AND INDICES OF INDIVIDUAL SKULLS—Con.

Catalog No.	Diam. front. min.	Menton-nasion height	Alv. pt.-nasion height	Diam. biz. max.	Facial index total	Facial index upper	Endo-bas.-nasion	Endo-bas.-sub-nasal pt.	Endo-bas.-prealv. pt.	Facial angle	Alveolar angle
CUPISNIQUE, MALE											
CU 2	9.9										
CU 5	9.9		6.7	(14.1)		*(47.5)*	10.5	9.6	11.0	67.5°	42.5°
CU 7	8.9		7.4?	(13.9)		*(53.2)*	10.3	9.0	10.2?	69.5	48.5
CU 8	10.0		6.8	(14.1)		*(48.2)*	9.8	8.5	9.5	72.0	53.0
CU 10	10.2?	11.0	6.5	14.0	*78.6*	*46.4*	9.7	8.6	9.8	70.0	49.0
CU 12	9.5		6.8?				10.4	8.4	10.5	70.0	36.5
CU 13	9.9	11.1?	6.6	13.7	*81.0*	*48.2*	9.9	9.0	10.7	65.0	38.5
CU 14	9.1										
CUPISNIQUE, FEMALE											
CU 1	9.1		6.4								
CU 3	9.3		6.2	13.1		*47.3*	9.4	8.6	10.0	66.5	44.0
CU 6	8.5	10.2	5.9	(12.4)	*(82.2)*	*(47.6)*					
CU 9			6.2	13.3		*46.6*					
CU 11	9.5						8.9				
MOCHICA, MALE											
M 1	9.9		6.8	14.1		*48.2*	9.6	8.4	9.5	70.0°	53.0°
M 2	9.6		6.5	13.8		*47.1*	10.5	8.9	9.7	78.0	54.0
M 5	8.5			13.1			10.1	9.2			
M 7	8.6		6.7	13.5		*49.6*	10.6	9.6	10.3	74.0	64.5
M 8	8.9		6.2	13.2		*47.0*					
M 11	9.0		6.3?	13.6?		*46.3*	10.3	8.8	9.9?	75.0	47.5
M 12	9.5		6.3	12.4?		*50.8*	9.8	9.0	10.1	69.0	50.0
M 13	8.7		6.7	14.0?		*47.8*					
M 14	9.2		6.4	12.6		*50.8*	9.4?	8.6	9.7?	68.0	51.0
M 15	9.6		6.8	13.7?		*49.6*	10.4	9.2	10.7	69.0	38.5
M 16	8.3		6.8				10.0	8.6	9.6	73.0	53.5
M 19			6.5				9.4	8.0	8.9	73.5	54.0
M 20	9.5		6.6	13.3		*49.6*	9.7	8.5	9.7	70.0	49.0
MOCHICA, FEMALE											
M 3	8.7		6.5	12.7		*51.2*	9.6	8.5	9.7	69.5	51.0
M 4	8.8		7.1	12.8		*55.5*	9.9	9.3	10.7	64.0	50.0
M 6	9.3		6.7	13.3		*50.4*	10.3	9.3	10.6	69.0	48.5
M 9	8.7		6.8	12.6		*54.0*	9.9	8.6	10.0	69.0	49.0
M 10	9.1						9.1				
M 17	9.4										
M 18	8.9										
M 21	8.7						9.7				

MEASUREMENTS (CM.) AND INDICES OF INDIVIDUAL SKULLS—Con.

Catalog No.	Orbits: height, right, left	Orbits: breadth, right, left	Orbital index mean	Nose height	Nose breadth, max.	Nasal index	Upper alv. arch, length	Upper alv. arch, breadth	Upper alv. arch, index
CUPISNIQUE, MALE									
CU 2									
CU 5	3.1 3.2	4.2 3.9	*77.8*	4.9	2.4	*49.0*	5 9	7.0	*118.6*
CU 7	3.3 3.4	 4.0	*83.8*	5.5	2.3	*41.8*	5.6	6.4	*114.3*
CU 8	3.4 3.4	3.9 3.9	*87.2*	5.0	2.4	*48.0*	5.4	6.9?	*127.8*
CU 10	3.1	4.0 4.0	*85.0*	4.6	2.4	*52.2*	5.6	6.2	*110.7*
CU 12	3.4	3.9	*87.2*	4.7	2.4	*51.1*	(5.4)		
CU 13	3.2 3.2	3.8 3.6	*86.5*	4.6	2.7	*58 7*	5.7		
CU 14									
CUPISNIQUE, FEMALE									
CU 1	 3.2	 3.8	*84.2*	4.6	2.7?	*58.7*	5.1	6.0	*117.6*
CU 3	2.8 3.0	3.7 3.7	*78.4*	4.3	2.5	*58.1*	5.1?		
CU 6	3.0 3.1	3.5 3.5	*87.1*	4.4	2.3	*52.3*	4.9	5.7	*116.3*
CU 9	3.2 3.2	3.6 3.6?	*88.9*	4.6	2.3	*50.0*	(5.2)	(6.2)	(119.2)
CU 11									

MEASUREMENTS (CM.) AND INDICES OF INDIVIDUAL SKULLS—Con.

Catalog No.	Orbits: height, right, left	Orbits: breadth, right, left	Orbital index mean	Nose height	Nose breadth, max.	Nasal index	Upper alv. arch, length	Upper alv. arch, breadth	Upper alv. arch, index
MOCHICA, MALE									
M 1	3.4 3.4	3.7 3.8	*90.7*	4.8	2.6	*54.2*	5.3	6.6	*124.5*
M 2	3.3 3.2	4.1 4.1	*79.3*	5.2	2.5	*48.1*	5.3	7.1	*134.0*
M 5	3.2 3.3	3.8 3.7	*86.7*	4.6	2.3	*50.0*			
M 7	3.5 3.5	3.6 3.7	*95.9*	4.7	2.2	*46.8*	5.3	6.2	*117.0*
M 8	3.1 3.0	3.5 3.3	*89.7*	4.5	2.1	*46.7*	5.7	6.3	*110.5*
M 11	3.4 3.4	3.6 3.6	*94.4*	4.7	2.5	*53.2*	5.0	6.4	*128.0*
M 12	3.1 3.2	3.8 3.7	*84.0*	4.5	2.3	*51.1*	5.5	6.0?	*109.1*
M 13	3.2 3.1	3.5 3.5	*90.0*	5.0	2.3	*46.0*	5.5	6.4	*116.4*
M 14	3.3	3.7	*89.2*	4.5			5.5		
M 15	3.5 3.4	3.8 3.8	*90.8*	5.1	2.4	*47.0*			
M 16	3.3	3.7	*89.2*	5.0	2.3	*46.0*	5.3	6.0	*113.2*
M 19	3.2	3.6	*88.9*	4.9	2.4	*49.0*	5.1	6.8?	*133.3*
M 20	3.1 3.1	3.6 3.6	*86.1*	4.7	2.4	*51.1*	5.5	6.4?	*116.4*
MOCHICA, FEMALE									
M 3	3.2 3.3	3.7 3.6	*89.0*	4.5	2.4	*53.3*	5.2?		
M 4	3.7 3.6	3.7 3.6	*100.0*	4.7	2.6	*53.3*	5.8	6.0	*103.4*
M 6	3.5 3.6	4.2 4.1	*85.5*	4.7	2.4	*51.1*	5.5	6.1	*110.9*
M 9	3.4 3.3	3.7 3.8	*89.3*	4.6	2.1	*45.6*	5.5		
M 10									
M 17									
M 18									
M 21									

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